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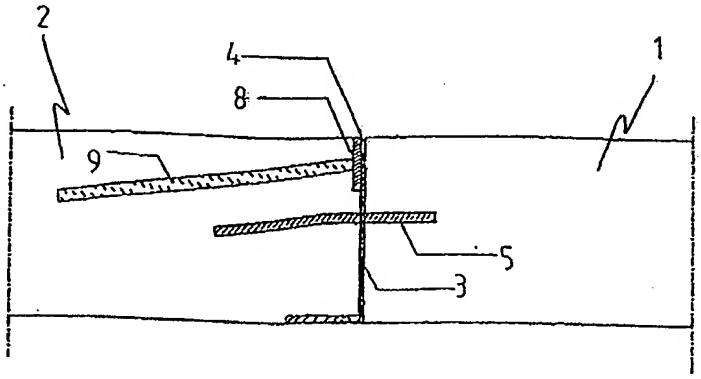

(57) Abstract

The invention relates to a method for manufacturing a ground slab field and a ground slab field comprising at least a first concrete slab and a second concrete slab (1 and 2). The first concrete slab and the second concrete slab are located substantially level side by side with a sheet–metal profile (3) between them. At least one substantially horizontal dowel plate (5) shaped substantially like a half–circle or a segment is fastened to the first side of the sheet–metal profile. At least one anchoring means (6) is fastened to the second side of the sheet–metal profile (3). The anchoring means (6) is at least partly sunk into the second concrete slab (2) so that the anchoring means (6) anchors the sheet–metal profile (3) stationary to the second concrete slab (2). The first dowel plate (5) is at least partly sunk into the first concrete slab (1) so that the first dowel plate (5) can only move substantially horizontally in the first concrete slab (1) so that the first concrete slab (1) and the second concrete slab (2) together with the sheet–metal profile (3) anchored stationary to it can only move substantially horizontally in relation to each other.

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METHOD FOR MANUFACTURING A GROUND SLAB FIELD AND A GROUND SLAB FIELD

BACKGROUND OF THE INVENTION

The invention relates to a method for manufacturing a ground slab field which comprises at least a first concrete slab and a second concrete slab, in which method at least a first casting mould and, beside it, a second casting mould is formed, which casting moulds have four sides, of which at least the side which is between the casting moulds is made of a sheet-metal profile, and which casting moulds have a floor made of earth or the like; concrete is poured into the casting moulds to produce the first concrete slab in the first casting mould and the second concrete slab in the second casting mould.

The invention also relates to a ground slab field comprising at least a first concrete slab and a second concrete slab, and the first concrete slab and the second concrete slab are located substantially level side by side with a sheet-metal profile between the first concrete slab and the second concrete slab.

The invention relates to ground slab fields, especially ground slab floors. Because a ground slab field shrinks when drying, the concrete slabs of a ground slab field move in relation to each other. For instance, temperature variations also cause relative movement of concrete slabs.

Ground slabs are cast on a bed of sand (bearing sand) which allows the concrete slabs to move in relation to the bed. Casting is done at the construction site using moulds which are placed on the bed. The moulds are usually placed on supports made on the bed so that the concrete slab settles at the correct height.

It is important that the ground slab floor is equipped with expansion joints which allow said relative movement of the concrete slabs. These expansion joints allow the lengthening, shortening and twisting of the slab. In expansion joints, the slab is usually completely cut. The relative movement of the concrete slabs must be controlled. This means that the concrete slabs must not rise vertically, i.e. height-wise, in relation to each other at the expansion joint. The concrete slabs must, however, be allowed to move horizontally in relation to each other. For this reason, these expansion joints utilise various dowel structures which aim at stopping the concrete slabs from moving incorrectly in relation to each other. The structure must be made such

that the expansion joint is able to transfer a transverse movement.

A ground slab must also be separated by an expansion joint from all load-bearing structures and the like, such as walls, columns, machine bases, floor ducts and floor drains.

A floor has expansion joints between the concrete slabs in longitudinal and transverse direction. According to recommendations, the longitudinal expansion joints are usually approximately 1.5 to 2 times longer than the transverse expansion joints.

Earlier, a sheet pile has been used in the longitudinal joints of a slab field and a mortise bolt in the transverse joints.

A sheet pile joint has a sheet pile made of wood or metal. Wooden sheet piles must be dismantled, but a steel sheet pile can either be dismantled or left in the concrete slab. Both joints have the common characteristic that when the floor shrinks, the sheet pile opens and also enables a small vertical movement, and that slab reinforcements often need to be used to prevent the sheet pile from giving. For its part, such a concrete slab reinforcement causes the edge of the concrete slab to rise up when shrinking. A sheet pile joint must not be used in hard-tyre truck traffic.

In a mortise bolt joint, the mould has conventionally been of wood. Steel armature is often used at the top part of the joint to protect the joint. The bolts are installed in holes drilled in the wood and, on the other side, a plastic tube enabling the shrink movement is installed on top of the bolt. Such a joint works when the slab shrinks in the direction of the bolts, but when the slab also shrinks in width, there is no room for movement. This joint type has many problems. Dismantling the mould means breaking it, so reuse is not possible. It is also quite difficult to ensure that the bolts stay straight. The edge of the joint usually frays during dismantling and the mould cannot be dismantled on the following day.

A third alternative for making a mortise bolt joint is to first cast the slab and then to saw, at the correct location, a joint equalling a depth of 0.3 x slab height in the concrete to guide the crack into the correct location, and then to putty the joint. A joint of this kind is difficult to extend until the wall, and the sawing is, as a working phase, difficult and expensive. When the concrete has hardened for approximately 8 to 24 hours, the joint also needs to be sawn, because if it is sawn too early, the edges will be damaged and if it is sawn too late, cracks may form randomly.

Prior art also includes the diamond dowel. It comprises mould-installed plastic parts, which are left in the cast, and when reinforcing the second side, square plates are installed into these recesses allowing a bi-directional movement. The mould work is the same as described above.

BRIEF DESCRIPTION OF THE INVENTION

It is thus an object of the invention to develop a method for manufacturing a ground slab field and a ground slab field solving the above-mentioned problems.

The method of the invention is characterized in that in it, a sheet-metal profile is used, the first side of which has at least one dowel plate shaped substantially like a half-circle or a segment fastened to it, and the second side of which sheet-metal profile has at least one anchoring means fastened to it, the sheet-metal profile is placed between a first casting mould and a second casting mould in such a manner that the at least one dowel plate shaped substantially like a half-circle or a segment on the first side of the sheet-metal profile is substantially horizontal in the first casting mould and that the at least one anchoring means on the second side of the sheet-metal profile is in the second casting mould, said at least one anchoring means is at least partly cast into the second concrete slab in such a manner that the anchoring means anchors the sheet-metal profile stationary into the second concrete slab, and the first dowel plate is at least partly cast into the first concrete slab in such a manner that the first dowel plate can only move substantially horizontally in the first concrete slab so that the first concrete slab and the second concrete slab together with the sheet-metal profile anchored stationary to it can only move substantially horizontally in relation to each other.

The ground slab field of the invention is characterized in that at least one substantially horizontal dowel plate shaped substantially like a half-circle or a segment is fastened to the first side of the sheet-metal profile, that at least one anchoring means is fastened to the second side of the sheet-metal profile, that the anchoring means is at least partly sunk into the second concrete slab so that the anchoring means anchors the sheet-metal profile stationary to the second concrete slab, and that the first dowel plate is at least partly sunk into the first concrete slab so that the first dowel plate can only move substantially horizontally in the first concrete slab so that the first concrete slab and the second concrete slab together with the sheet-metal

profile anchored stationary to it can only move substantially horizontally in relation to each other.

The preferred embodiments of the ground slab field of the invention are disclosed in the dependent claims 3 to 10.

In the solution of the invention, at least one substantially horizontal dowel plate shaped substantially like a half-circle or a segment is fastened to the first side of the sheet-metal profile. At least one anchoring means is correspondingly fastened to the second side of the sheet-metal profile. The first dowel plate is sunk into the first concrete slab.

Since in the solution of the invention, the purpose is to fasten the sheet-metal profile to the second concrete slab, the at least one anchoring means fastened to the sheet-metal profile is sunk into the second concrete slab. The anchoring means on the second side of the sheet-metal profile fasten the sheet-metal profile better to the second concrete slab than the dowel plate fastens the sheet-metal profile to the first concrete slab. Due to the relative movement of the concrete slabs, the sheet-metal profile will thus remain fastened to the second concrete slab. The sheet-metal profile will unfasten from the first concrete slab, and the first concrete slab and the second concrete slab together with the sheet-metal profile fastened to it can move in relation to each other. Because the first dowel plate is fastened to the sheet-metal profile, which is fastened by the anchoring means to the second concrete slab, the movement of the first and the second concrete slab becomes controlled. Because the concrete slabs must not move vertically in relation to each other, the first dowel plate is substantially horizontal. However, the horizontal first dowel plate allows a horizontal movement and since the first dowel plate is shaped like a segment or half-circle, it allows horizontal movement without load peaks, because such a substantially segment- or half-circle-shaped dowel plate does not have corners to which the first concrete slab may catch on.

The solution of the invention provides the advantage that it can be used in ground slab fields in both longitudinal and transverse joints.

The solution of the invention allows the concrete slab to move both along the joint and at a right-angle against the joint.

The first dowel plate is preferably shaped like a half-circle or a segment, because these shapes do not cause load peaks, like shapes with corners do.

The solution of the invention facilitates casting, because there is one entity comprising a sheet-metal profile with at least one substantially horizontal dowel plate fastened to its first side and at least one anchoring means fastened to its second side, which entity is installed in place and fastened to its base (footing) without separate form work, pin installation or boring.

In the solution of the invention, the mould also need not be dismantled after casting.

The method of the invention makes a faster phasing possible for casting work, because the adjacent concrete slab can be cast immediately after the previous one or even at the same time.

In addition, in the solution of the invention, the operation of the joint can be calculated according to calculation instructions.

In the method of the invention, the dowel plates and anchoring plates stay straight and securely in place and their operation is ensured, because they are fastened to the sheet-metal profile which is left in the structure.

In the solution of the invention, no slab reinforcements are needed in the joint, because the edge of the concrete slab does not rise when the concrete slab shrinks and because there are structures fastened to both sides of the sheet-metal profile of the concrete slabs to prevent this.

The method of the invention reduces subsequent work, because the sheet-metal profile used has anchoring means fastened to one side of the profile and dowel plates on the other side of the profile and the sheet-metal profile is left in the ground slab field, i.e. not removed from it.

BRIEF DESCRIPTION OF THE INVENTION

In the following, the invention will be described in more detail in connection with preferred embodiments and with reference to the attached drawings in which

Figure 1 shows a side view illustrating a cross-profile of a joint between two concrete slabs,

Figure 2 shows a side view illustrating a cross-profile of a joint between two concrete slabs,

Figure 3 shows a side view illustrating a cross-profile of a joint between two concrete slabs,

Figure 4 shows a cross-profile of a joint between two concrete slabs from above, and

Figure 5 shows a second concrete slab.

DETAILED DESCRIPTION OF THE INVENTION

The figures show a ground slab field of the invention, which comprises at least a first concrete slab 1 and a second concrete slab 2. The first concrete slab 1 and the second concrete slab 2 are located substantially level side by side with a sheet-metal profile 3 between the first concrete slab 1 and the second concrete slab 2.

The length of the sheet-metal profile depends on the length of the joint, and the height of the sheet-metal profile depends on the height of the first concrete slab 1 and the second concrete slab 2.

There is preferably also a putty joint 4 between the first concrete slab 1 and the second concrete slab 2.

The ground slab field can be a concrete floor, for instance.

In the ground slab field of the invention, at least one substantially horizontal dowel plate 5 shaped substantially like a half-circle or a segment is fastened to the first side of the sheet-metal profile 3.

At least one anchoring means 6, which is adapted to anchor the sheet-metal 3 stationary into the second concrete slab 2, is fastened to the second side of the sheet-metal profile 3.

The first dowel plate 5 is at least partly sunk into the first concrete slab 1, and the anchoring means 6 is at least partly sunk into the second concrete slab 2.

The purpose of the solution of the invention is that the anchoring means 6 anchors the sheet-metal profile 3 stationary into the second concrete slab 2 and the first dowel plate 5 is substantially horizontal in the first concrete slab 1, in which case the first dowel plate 5 can only move substantially horizontally in the first concrete slab 1. For this reason, the first concrete slab 1 and the second concrete slab 2 together with the sheet-metal profile fastened stationary to it can only move substantially horizontally in relation to each other. The first concrete slab 1 is detached from the second concrete slab 2 at the sheet-metal profile 3 so that the sheet-metal profile 3 remains fastened to the second concrete slab 2.

The first dowel plate 5 and the anchoring means 6 are preferably fastened to the sheet-metal profile 3 without a joint. This means that the first dowel plate 5 and/or the anchoring means 6 is formed of a fixed part of the sheet-metal profile 3.

The first dowel plate 5 and the anchoring means 6 are preferably fastened to the sheet-metal profile 3 by welding.

The anchoring means is preferably made of a second dowel plate 6.

The second dowel plate 6 is preferably shaped so that it at least partly differs from the horizontal, as shown in Figures 1 to 3. This helps the second dowel plate 6 to anchor better to the second concrete slab 2.

Alternatively, the second dowel plate 6 comprises anchoring means (not shown in the figures) adapted to anchor the second dowel plate 6 to the second concrete slab 2.

The second dowel plate 6 can also at least partly differ from the horizontal and comprise anchoring means.

The first dowel plate 5 and the second dowel plate 6 are preferably fastened to each other.

The first dowel plate 5 and the second dowel plate 6 are most preferably fastened to each other jointlessly, which in this case means that they are made of an originally uniform part.

The first dowel plate 5 and the second dowel plate 6 preferably form together a substantially circular structure.

Approximately 1/3 of the structure made up by the first dowel plate 5 and the second dowel plate 6 is preferably in the first concrete slab 1 and approximately 2/3 of the structure made up by the first dowel plate 5 and the second dowel plate 6 in the second concrete slab 2.

The structure made up by the first dowel plate 5 and the second dowel plate 6 is preferably fastened to an opening (not shown in the figures) extending through the sheet-metal profile 3.

The first dowel plate 5 preferably comprises a bearing element 7 to improve the movement between the first dowel plate 5 and the first concrete slab 1.

The bearing element 7 is preferably a plastic part which at least partly surrounds the first dowel plate 5.

The sheet-metal profile 3 is preferably L-shaped in cross-profile and located so that the horizontal part of the L-shaped profile is below the second concrete slab 2, i.e. on the same side as the anchoring means.

Figure 1 shows a solution in which only the second concrete slab 2 comprises an additional reinforcement 8.

Figures 2 and 3 show a structure in which both the first concrete slab 1 and the second concrete slab 2 comprise an additional reinforcement 8.

At least the additional reinforcement 8 in the first concrete slab 1 is preferably fastened with a fastening means (not shown in the figures), which unfastens as a result of the relative movement of the first concrete slab 1 and the sheet-metal profile 3. Said fastening means can be a double-sided adhesive tape, for instance.

Alternatively, the additional reinforcement 8 in the first concrete slab 1 is fastened to the sheet-metal profile 3 with a plug weld so that a hole (not shown in the figures) is bored into the additional reinforcement 8 for the weld. Such holes and corresponding welds are made at every 400 to 800 mm, preferably at approximately every 600 mm. The additional reinforcement 8 in the second concrete slab 2 is also fastened to the sheet-metal profile 3 with a plug weld, but these welds are placed centrally with respect to the earlier ones and the distance between the welds in the halves is 200 to 400 mm, preferably approximately 300 mm. When the ground slab field shrinks, the rigidity of the sheet-metal profile 3 between the plug welds is so small that the sheet-metal profile 3 gives and change of shape is possible.

Alternatively, the additional reinforcement 8 and the sheet-metal profile 3 are fastened to each other with aluminium parts, such as aluminium pop rivets (not shown in the figures), having a considerably smaller strength than steel, and the rivets are left slightly loose. When the ground slab field shrinks, aluminium or the like, being weaker, gives and the joint can operate. Alternatively, the additional reinforcements 8 and the sheet-metal profile 3 are fastened to each other with conventional pop rivets which have an O ring underneath.

Alternatively, the additional reinforcements 8 and the sheet-metal profile 3 are fastened to each other with elastic rubber nuts or the like (not shown in the figures). The rubber/plastic item is fastened to a hole (not shown in the figures) drilled through the sheet-metal profile. When the ground slab field shrinks, the rubber yields and the floor can change shape.

A combination of the above fastening methods is also possible.

In the structures illustrated in the figures, the additional reinforcement 8 is also anchored to the concrete slabs 1, 2 with fixing lugs 9 fastened to the additional reinforcement 8.

The invention also relates to a method for manufacturing a ground slab field.

In the method, at least a first casting mould and, beside it, at least a second casting mould (not shown in the figures) is formed, which have four sides (not shown in the figures), of which at least the side which is between the first and the second casting mould is made of a sheet-metal profile, and which casting moulds also have a floor (not shown in the figures) made of earth (not shown in the figures) or the like, and concrete is poured into the casting moulds.

The other casting mould sides can be made in other ways. For instance, if the other sides of the casting mould are against a wall, casting mould sides which create a gap (not shown in figures) between the wall and the concrete slab can be used. The gap between the wall and the concrete slab is achieved using profiles (not shown in the figures), for instance, which are removed from between the wall and the concrete slab leaving an empty space.

The method of the invention uses a sheet-metal profile 3 with at least one half-circle- or segment-shaped dowel plate 5 fastened to its first side and at least one anchoring means 6 fastened to its second side.

The sheet-metal profile 3 is placed between the first casting mould and the second casting mould so that the at least one substantially half-circle- or segment-shaped dowel plate 5 on the first side of the sheet-metal profile 3 is substantially horizontal in the first casting mould and so that the at least one anchoring means 6 on the second side of the sheet-metal profile 3 is in the second casting mould. After this, the concrete is poured into the first casting mould and the second casting mould to produce a first concrete slab in the first casting mould and a second concrete slab in the second casting mould.

In the method of the invention, said at least one anchoring means 6 is cast at least partly into the second concrete slab 2 so that the anchoring means 6 anchors the sheet-metal profile 3 stationary to the second concrete slab 2. The first dowel plate 5 is correspondingly cast at least partly into the first concrete slab 1 so that the first dowel plate 5 can only move substantially

horizontally in the first concrete slab 1 so that the first concrete slab 1 and the second concrete slab 2 together with the sheet-metal profile 3 anchored stationary to it can only move substantially horizontally in relation to each other.

It is obvious to a person skilled in the art that while technology progresses, the basic idea of the invention can be implemented in many ways. The invention and its embodiments are thus not restricted to the examples described above, but can vary within the scope of the claims.

CLAIMS

1. A method for manufacturing a ground slab field which comprises at least a first concrete slab (1) and a second concrete slab (2), in which method

at least a first casting mould and, beside it, a second casting mould is formed, which casting moulds have four sides, of which at least the side which is between the casting moulds is made of a sheet-metal profile (3), and which casting moulds have a floor made of earth or the like,

concrete is poured into the casting moulds, and

the first concrete slab (1) is produced in the first casting mould and the second concrete slab (2) in the second casting mould,

characterized in that in the method

a sheet-metal profile (3) is used, the first side of which has at least one dowel plate (5) shaped substantially like a half-circle or a segment fastened to it, and the second side of which sheet-metal profile (3) has at least one anchoring means (6) fastened to it,

the sheet-metal profile (3) is placed between a first casting mould and a second casting mould in such a manner that the at least one dowel plate (5) shaped substantially like a half-circle or a segment on the first side of the sheet-metal profile (3) is substantially horizontal in the first casting mould and that the at least one anchoring means (6) on the second side of the sheet-metal profile (3) is in the second casting mould,

said at least one anchoring means (6) is at least partly cast into the second concrete slab (2) in such a manner that the anchoring means (6) anchors the sheet-metal profile (3) stationary into the second concrete slab (2), and

the first dowel plate (5) is at least partly cast into the first concrete slab (1) in such a manner that the first dowel plate (5) can only move substantially horizontally in the first concrete slab (1) so that the first concrete slab (1) and the second concrete slab (2) together with the sheet-metal profile (3) anchored stationary to it can only move substantially horizontally in relation to each other.

2. A ground slab field comprising at least

a first concrete slab (1) and a second concrete slab (2),

and the first concrete slab (1) and the second concrete slab (2) are located substantially level side by side with a sheet-metal profile (3) between the first concrete slab (1) and the second concrete slab (2), **characterized** in that

at least one substantially horizontal dowel plate (5) shaped substantially like a half-circle or a segment is fastened to the first side of the sheet-metal profile (3),

at least one anchoring means (6) is fastened to the second side of the sheet-metal profile (3),

the anchoring means (6) is at least partly sunk into the second concrete slab (2) so that the anchoring means (6) anchors the sheet-metal profile (3) stationary to the second concrete slab (2), and

the first dowel plate (5) is at least partly sunk into the first concrete slab (1) so that the first dowel plate (5) can only move substantially horizontally in the first concrete slab (1) so that the first concrete slab (1) and the second concrete slab (2) together with the sheet-metal profile (3) anchored stationary to it can only move substantially horizontally in relation to each other.

3. A ground slab field as claimed in claim 2, **characterized** in that the anchoring means (6) is formed of a second dowel plate (6).

4. A ground slab field as claimed in claim 3, **characterized** in that the second dowel plate (6) is shaped so that it at least partly differs from the horizontal.

5. A ground slab field as claimed in claim 3, **characterized** in that the first dowel plate (5) and the second dowel plate (6) are fastened to each other.

6. A ground slab field as claimed in claim 5, **characterized** in that the first dowel plate (5) and the second dowel plate (6) form together a substantially circular structure.

7. A ground slab field as claimed in claim 5, **characterized** in that the structure formed by the first dowel plate (5) and the second dowel plate (6) is fastened to a hole extending through the sheet-metal profile (3).

8. A ground slab field as claimed in claim 2, **characterized** in that the first dowel plate (5) comprises a bearing element (7) to improve the movement between the first dowel plate (5) and the first concrete slab (1).

9. A ground slab field as claimed in claim 8, **characterized** in that the bearing element (7) is a plastic part which at least partly surrounds the first dowel plate (5).

10. A ground slab field as claimed in claim 2, **characterized** in that the sheet-metal profile (3) is L-shaped in cross-profile and located so that the horizontal part of the L-shaped profile is in the bottom area of the second concrete slab 2.

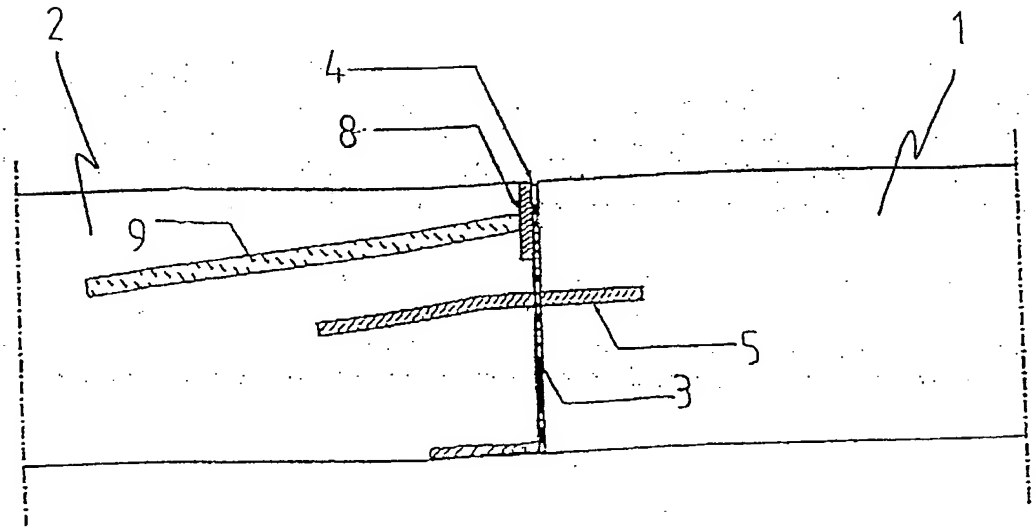

FIG 1

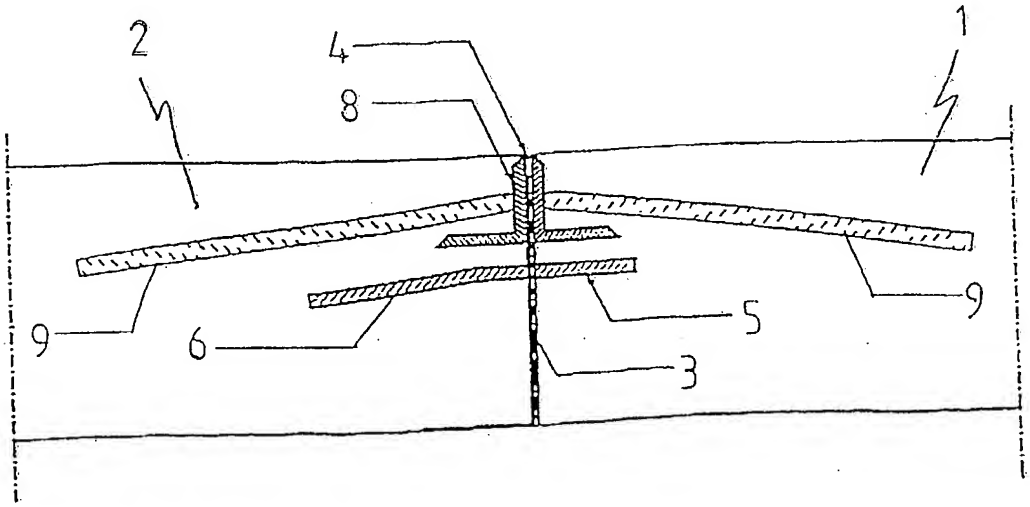

FIG 2

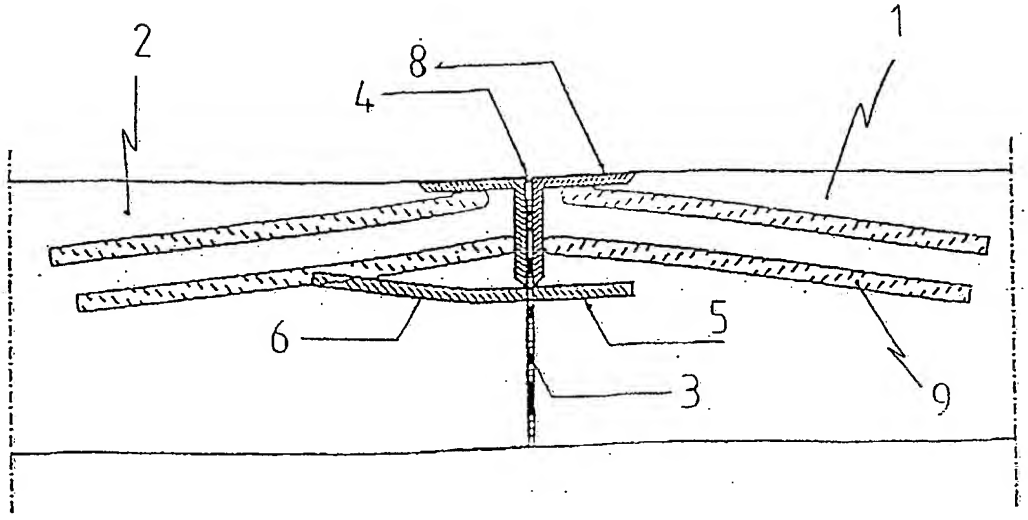

FIG 3

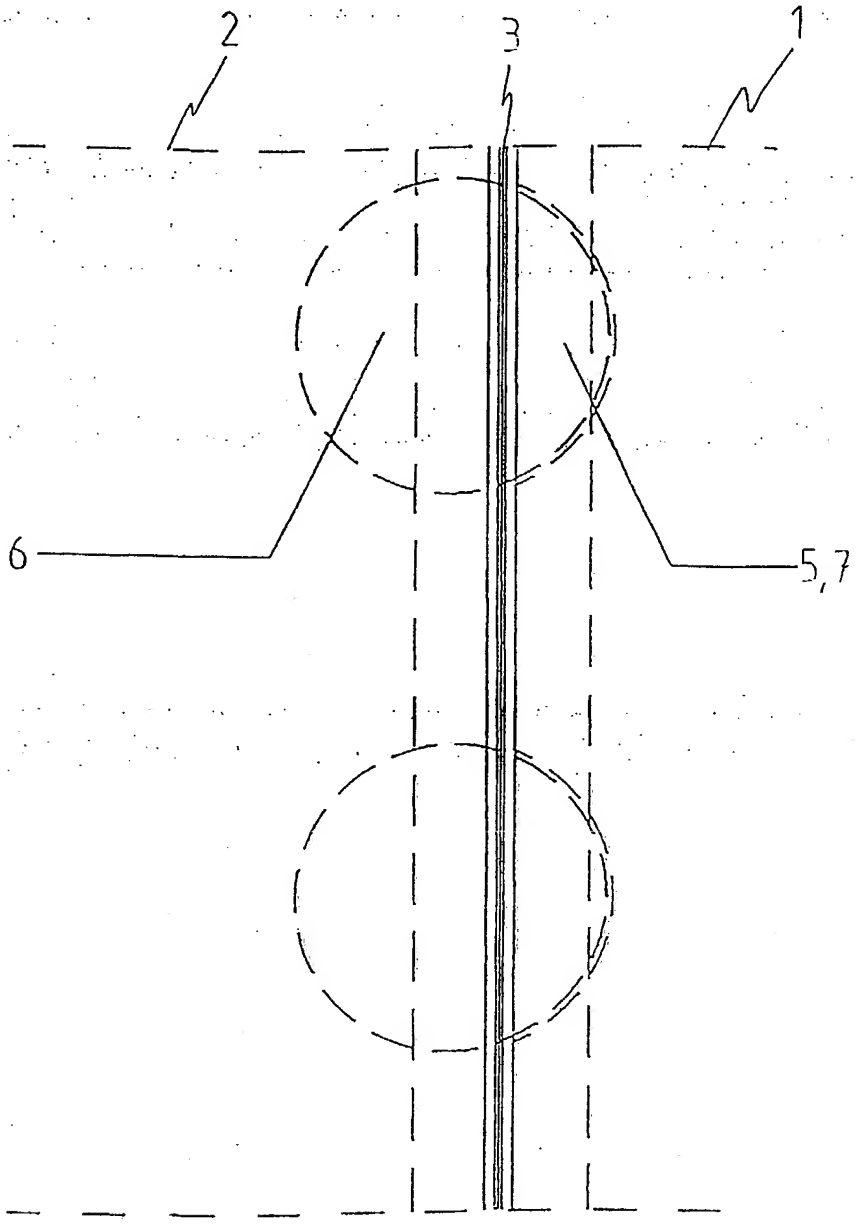

FIG 4

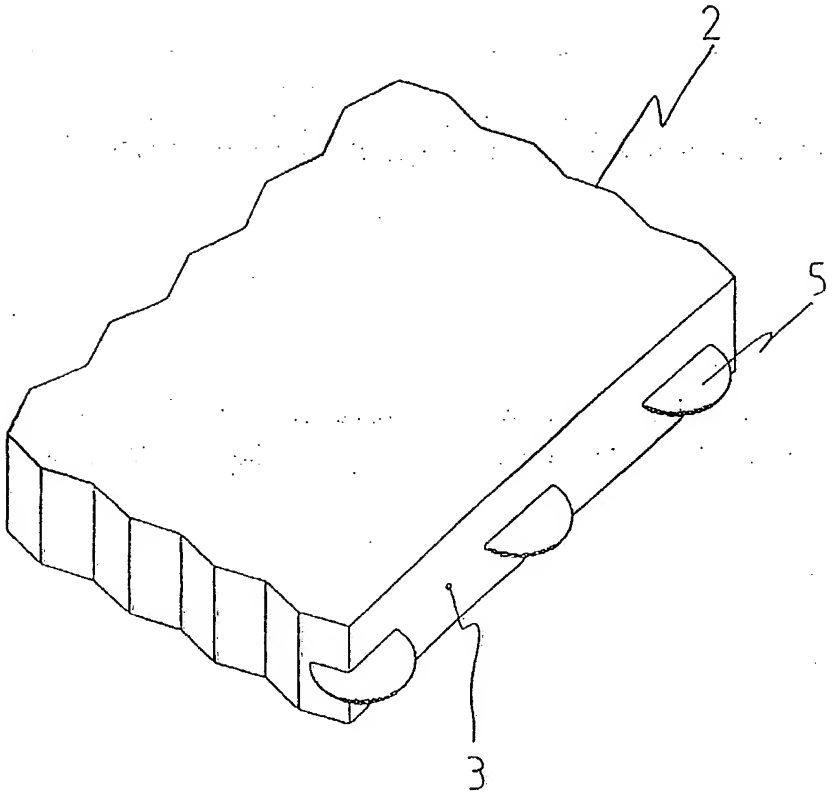

FIG 5

INTERNATIONAL SEARCH REPORT

International application No.
PCT/FI 99/00865

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: E01C 11/04, E02D 27/01, E04F 15/14
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: B28B, E01C, E02D, E04F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4657430 A (J.L. MARIONNEAUX), 14 April 1987 (14.04.87), column 2, line 36 - column 3, line 40, figures 1-3	1-4,8
A	EP 0119652 A2 (WITSCHI, H. ET AL), 26 Sept 1984 (26.09.84), page 4, line 16 - page 5, line 20, figures 1-4	1-10
A	US 5674028 A (K.N. NORIN), 7 October 1997 (07.10.97), figures 3-5, abstract	1-10

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
3 February 2000	07 -02- 2000
Name and mailing address of the ISA Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Ingemar Hedlund / MR Telephone No. +46 8 782 25 00

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/FI 99/00865

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2500262 A (W.J. PARROTT), 14 March 1950 (14.03.50), column 2, line 28 - column 3, line 40, figures 1,2	1-10

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/FI 99/00865

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4657430 A	14/04/87	NONE	
EP 0119652 A2	26/09/84	SE 0119652 T3	
		AT 20765 T	15/08/86
		CA 1220046 A	07/04/87
		US 4578916 A	01/04/86
US 5674028 A	07/10/97	NONE	
US 2500262 A	14/03/50	NONE	